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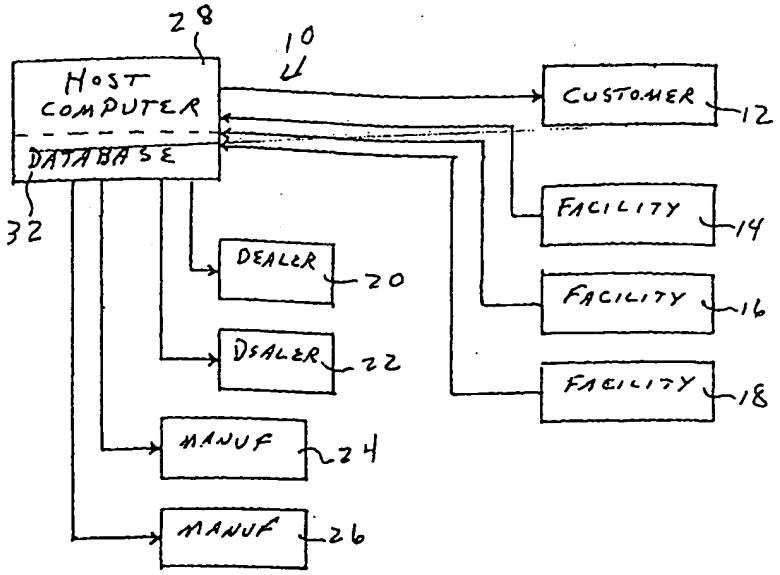
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(54) Title: DISTRIBUTION MANAGEMENT AND INVENTORY CONTROL SYSTEM

(57) Abstract

A host computer (28) receives inventory data from a plurality of receiving computers (34) or other data collection devices (30) located at the respective facilities (14, 16 and 18) of a customer or other party in the distribution chain. Each facility includes a storage area (40) with inventory items stored therein for use by the facility. A bar code reader (36) is used to read the bar code (44) from each item added to, removed from, returned to, or remaining in the storage area (40) and to provide corresponding item identification data to the receiving computer (34). Host computer (28) receives the item identification data from all of the receiving computers (34) of the facilities and provides a consolidated invoice for all of the facilities. If the facilities (14, 16 and 18) are served by different dealers, the host computer (28) is also operable to convert the item identification data to dealer–specific data including the respective dealer codes for the items for replenishing the inventory at each storage area (40). The host computer (28) is also operable to sort the item identification data by manufacturer and to provide corresponding data to specific manufacturers for production planning. The host computer (28) is also operable to prepare a variety of other reports for each party, including but not limited to material safety reports, environmental reports, job cost reports, and marketing reports.



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DISTRIBUTION MANAGEMENT AND INVENTORY CONTROL SYSTEM

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

The present invention relates to the field of inventory control. In particular, the invention is concerned with a distribution management and inventory control system that receives inventory data from a plurality of dealer and customer facilities and processes the data for use in consolidated invoicing and replenishment of inventory at each facility.

2. DESCRIPTION OF THE PRIOR ART

In some industries, such as the printing industry, it is customary for a facility of a customer to include a storeroom of inventory items owned by various dealers. The customer removes inventory items from the storeroom as needed for use. Periodically each dealer takes an inventory count, replenishes its used inventory items and invoices the customer for inventory items removed from the storeroom.

As will be appreciated, this prior art system of inventory control can lead to a number of problems. Inventory items may be depleted before scheduled replenishment which can shut down production or require emergency replenishment by a dealer. This prior art system also results in

many invoices being generated by the various dealers to the customer. Another problem is that the manufacturers of the inventory items do not receive any lead time for efficient production planning in order to supply the needed inventory items.

Another problem is that some inventory items require the generation of specialized reports such as product safety data reports and environmental impact reports. The prior art system basically requires separate or non-consolidated generation of the needed data for the reports and the time-consuming preparation of each individual report.

SUMMARY OF THE INVENTION

The present invention solves the prior art problems mentioned above and provides a distinct advance in the state of the art. More particularly, the distribution management and inventory control system hereof enables the consolidation of inventory usage on a timely basis from a plurality of customer and dealer facilities for consolidated billing, the timely replenishment of the inventory before depletion and the provision of adequate lead time to the manufacturers and dealers of the inventory items. In addition, the system of the invention provides for automatic generation of needed reports.

The preferred distribution management and inventory control system includes a host computer that receives inventory data from a plurality of receiving computers located at the respective facilities of a customer, dealer and manufacturer. Each facility includes a storage area such as a storeroom, locker, bin, truck trailer, or even a directory or file in a computer-readable storage device for electronic records. The storage area has inventory items such as consignment items of any party in a manufacturing and distribution channel such as a manufacturer, distributor, or dealer stored therein for use by the facility. In the preferred embodiment, a bar code reader is used to read the bar code from each item removed from the storage area and to provide corresponding item identification data to the receiving computer. The host computer receives the item identification data from all of the receiving computers of the facilities and provides the capability to produce consolidated invoices and reports for all of the facilities of each party in the distribution channel.

If the facilities are served by different dealers, the host computer is also operable to convert the item identification data to dealer-specific data including the respective dealer codes for the items for replenishing the

inventory at each storage area. The host computer is also operable to sort the item identification data by manufacturer and to provide corresponding data to specific manufacturers for production planning. Additionally, the host computer uses the item identification data to generate needed reports such as product safety data reports and environmental impact reports. The host computer can also generate a variety of other reports, such as use reports by type of products, price levels, and other item characteristics. The preferred aspects of the present invention are disclosed herein.

The inventory control scheme of the present invention is not a proprietary-based model that can only be accessed by one group of organizations in one supply chain. Instead, the host computer may be used by several different groups of organizations in several supply chains.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a block diagram illustrating the preferred distribution management inventory control apparatus in accordance with the present invention; and

Fig. 2 is a block diagram illustrating a facility that could be located on site at the customer, the dealer, or the manufacturer of Fig. 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The drawing figures illustrate preferred distribution management and inventory control apparatus 10 in accordance with the present invention. Fig. 1 shows apparatus 10 in use with a plurality of customers such as customer 12 having a plurality of facilities such as facilities 14, 16 and 18, and also with a plurality of dealers such as dealers 20 and 22 and a plurality of manufacturers such as manufacturers 24 and 26. Apparatus 10 includes host computer 28 and inventory data collection equipment located at each facility such as equipment 30 illustrated in Fig. 2.

Host computer 28 preferably includes a conventional network server computer operable to receive and transmit data over telephone lines and operable to store needed data in database 32. Computer 28 also includes a financial computer coupled with the server computer and operable to access database 32 to perform financial functions such as producing invoices, financial statements and the like. Additionally, computer 28 is under program control to perform the operational functions described further herein. The preferred

program includes a conventional database manager such as Microsoft ACCESS or Microsoft SQL Server.

In the preferred embodiment, host computer 28 is operable to communicate by way of the internet or by way of any other conventional communication medium using conventional telephone lines with equipment 30 of facilities 14-18, and is also operable to communicate with computers at a central office of customer 12, dealers 20-22 and manufacturers 24-26. It will also be appreciated that communications could also be provided by way of direct dial instead of using the internet, by cellular telephone, satellite and a wide variety of other communication modes.

The host computer 28 preferably operates under a subscription-based hosted application model, commonly referred to as an Application Service Provider (ASP) or Commerce Service Provider (CSP). In this way, the inventory control scheme of the present invention is not a proprietary-based model that can only be accessed by one group of organizations in one supply chain. Instead, the host computer may be used by several different groups of organizations in several supply chains. Authorized users can participate in the inventory tracking and control functionalities of the present invention at any time from anywhere by simply accessing the host computer with a standard internet browser and then gaining access to certain information applicable to the users. By adopting a hosted application model, improvements in software features can be rapidly deployed to all users. Moreover, each group of users that wishes to implement the inventory control schemes of the present invention does not have to make investments for installing, hosting, and maintaining the host computer and the software applications thereon.

Referring to Fig. 2, equipment 30 is located at each facility 14-18 and includes personal computer (PC) 34, bar code reader 36 coupled with PC 34, and identification (ID) card reader 38 also coupled with PC 34. Bar code reader 36 and PC 34 are located in the storage area 40 on the site of the facility, and the ID card reader 38 is positioned outside the storage area adjacent door 42 in order to control electrically the lock thereof in the conventional manner. This allows access to storage area 40 only by authorized personnel and each entry is logged in PC 34 as identification data representative of the person entering storage area 40.

The central concept is that the host computer 28 receives frequent reports of which item was added to, removed from, returned to, or remaining in, which storage area, by whom, on which date. If any site provides

additional data, the system can generate additional reports. For example, if job code data is sent, the system can generate job cost data.

The host computer 28 provides a virtual "Supply Chain Network" that permits all organizations in a supply chain to manage and/or view inventory data, whether the inventory is located in a location under their control or in a location under another supply chain organization's control. Thus, all organizations in a supply chain, including manufacturers, distributors, and end users, may all participate in inventory control and management using one network and may share information on a need-to-know basis.

The database or databases operated by the host computer 28 are preferably filtered or segmented so that particular organizations in a supply chain can only get access to and view certain information relative to them. For example, a national customer may be permitted to access and view all inventory records for all of their plants across the country. Distributors for the national customer may also be permitted to access the host computer via the internet, but may be given access only to their own inventory and inventory that they have supplied to the customer. Similarly, a manufacturer may be permitted to access the host computer and view information relating to the products it has supplied to the customer through various distributors. This permits the manufacturer to instantaneously check inventory trends to enhance the manufacturer's production planning.

Hierarchal database filtering techniques are implemented via the host computer 28 to present users only with the information that they are entitled to view. Once a user has accessed and logged onto the host computer, the user can view all inventory records to which it has access.

Although the preferred embodiment is to use key card access to the storage area, bar code scanner input of the item identified, and computer transmission of the data via the Internet, some or all of these steps could be performed manually. For instance, each person adding or removing an item could fill out lines on a paper form kept on a clipboard, and a separate person could fax the filled out report or phone in the results at a specified time, such as once each day. While manual performance of the steps is possible, the automation described offers numerous advantages as described herein.

In the example of Fig. 1, customer 12 has a plurality of production facilities in various locations illustrated by facilities 14-18. Even though only one customer is illustrated the present invention encompasses the ability to provide inventory control services to a plurality of customers as well. Also as

illustrated, dealer 20 provides the distribution services for inventory items to facility 14, and dealer 22 supplies the needed inventory items to facilities 16 and 18. The dealers 20 and 22 may also provide distribution services for inventory items to one another. Dealers 20 and 22, and manufacturers 24 and 26, could also have storage areas like that in Fig. 2.

Fig. 1 also illustrates manufacturers 24 and 26 who manufacture certain ones of the inventory items used by facilities 14-18. It is common for customer 12 to have a national account for all of its facilities with various manufacturers illustrated by manufacturers 24 and 26. The dealers distribute the needed inventory items from a variety of manufacturers to a customer's facility.

One of the principal advantages of the system is that it enables either a manufacturer or a customer to more easily work with multiple distributors or dealers. For instance, a national customer that purchased a local facility with a close relationship with a local dealer would ordinarily require that facility to start using the customer's national distributor in order to more easily get consolidated reports and invoices. If both the national distributor and the local dealer use this system, the national customer can allow the local facility to continue using the local dealer, but still easily get its consolidated reports and invoices.

Thanks to this system, the dealer does not lose the local customer and can easily function as a local arm of the national distributor. Indeed, the system contemplates a variety of services that the local dealer may or may not perform when acting as such a local arm.

In the operation of apparatus 10, ID card reader 38 reads the ID card of a person authorized to enter storage area 40 and supplies identification data representative thereof to PC 34. PC 34 stores and time stamps all attempted entries, whether authorized or not as a security record. If there is a match to a list of authorized persons, PC 34 activates the latch on door 42 to release and allow entry. The person enters storage area 40 and gathers the needed inventory items. Typically the inventory items removed from storage area 40 are used for immediate production and thereby represent current usage.

Before leaving storage area 40, the person uses bar code reader 36 to scan the bar code on each inventory item such as bar code 44 on inventory item 46. In response to the scan, bar code reader 36 provides item identification data representative of the bar code and thereby representative of

the inventory item to PC 34 where this data is stored. As will be appreciated, the bar code on each inventory item is typically the UPC code printed thereon by the manufacturer. The present invention also encompasses the ability to read other machine-readable indicia such as alphanumeric text and magnetic ink.

On a periodic basis, such as each night, PC 34 accesses host computer 28 by way of the internet or any other communication medium. In the alternative, host computer 28 polls PC 34 in each facility. Upon establishing communications with host computer 28, PC 34 transmits all of its inventory data since the last transmission. The inventory data includes the item identification data along with the data identifying each person entering storage area 40. This process is repeated for each facility for 14-18 and for each customer, dealer, and manufacturer served by apparatus 10. Host computer 28 stores the inventory data received from facilities 14-18 in database 32. On a periodic basis, such a monthly, host computer 28 consolidates the inventory data from facilities 14-18 for customer 12 and generates consolidated invoices and reports.

The bar code information as well as other inventory data may be transmitted directly to the host computer 28 from the PC 34 via the internet rather than being stored on the PC. This permits the host computer to validate the information and respond to an operator if additional information is needed.

The host computer 28 may also automatically generate invoices immediately upon the close of a certain time period. The invoices may be e-mailed to a customer or other entity, or the customer may access the host computer via the internet and view and download invoices when desired.

Database 32 includes information indicating which dealer 20-22 supplied the inventory items to facilities 14-18. Upon receipt of payment from customer 12, the receipts are distributed to dealers 20-22 in accordance with the inventory items supplied by each to the facilities of customer 12. This process is repeated for all of the customers served by apparatus 10. The same process can be used to generate invoices from one dealer to its sub-dealer or from one manufacturer to its dealers.

As will be appreciated, dealers may use product codes different from the UPC codes placed on the inventory items by the respective manufacturers. In order to supply dealers 20-22 with data in a useful format, host computer 28 uses lookup tables stored in database 32 to convert the item identification data in terms of the UPC indicia code to item identification data

as the respective dealer code. More particularly, database 32 stores a lookup table for each dealer with the entries corresponding to UPC code and the equivalent dealer code. In this way, the reconciliation of payments from customer 12 can be expressed in terms of dealer code for each dealer.

Apparatus 10 also provides communications by way of the internet or other communication medium between host computer 28 and each dealer 20-22. These communications can include the inventory usage for each facility 14-18 expressed in terms of the respective dealer codes. With this capability, host computer 28 can provide each dealer with usage data for the facilities it supplies as frequently as needed. For example, host computer 28 can provide a daily summary of the usage of each inventory item. This summary can further include the remaining number of inventory items in the respective storage areas and can highlight those items likely to need replenishment before the next scheduled delivery. In the alternative, each dealer 20-22 has the capability of requesting this usage data from host computer 28.

The host computer 28 may also generate and automatically send e-mail notifications to the dealers or other entities upon the occurrence of certain events. For example, if inventory is removed from a storage area or if the inventory in a storage area reaches a predetermined level, the host computer 28 may automatically send an e-mail notification to a dealer of the inventory and even the manufacturer of the inventory so that the inventory can be quickly replenished.

With the availability of this usage information, the dealer can replenish needed inventory items before an outage occurs thereby providing a higher level of service to customer 12. Moreover, this information presents an itemized list of exactly what items and in what quantities are needed to replenish the inventory of each facility on a given day. This allows the dealer to load and supply the inventory items as needed to replenish the inventory to the specified levels.

Host computer 28 also sorts the inventory data for each customer by manufacturer. In particular, computer 28 identifies those inventory items used by facilities of customer 12 that are associated with specific manufacturers such as manufacturers 24 and 26. This manufacturer-specific usage data is then made available to each manufacturer. For example, computer 28 can provide a weekly usage and on-hand or available stock report to manufacturers 24 and 26. This information can be used by each

manufacturer to plan production and shipment in advance of receiving specific purchase orders from dealers 20 and 22. In this way the needs of customer 12 can be anticipated thereby providing a higher level of service and efficiency. Such may enable manufacturers 24, 26 to offer a more favorable pricing structure.

Some inventory items may require the production of certain reports. For example, printing facilities use certain chemicals that may present a potential safety hazard. As such, each facility is required to have on site a material safety data sheet. In the present invention, host computer 28 stores the information to produce product safety data sheets for each inventory item tracked in database 32. Host computer 28 also tracks the inventory items used by each facility and can download the information for printing such data sheets to each facility. Such can occur automatically whenever a facility uses a new inventory item.

An example of another required report is a environmental impact report such as Kansas SARA Title III report. Such reports are based on usage for each facility and host computer 28 includes the needed information in database 32 for automatically producing such reports as needed for each facility.

It will also be appreciated that the information stored in database 32 enables the production of a wide variety of reports. These can include usage reports to the customers, the dealers and the manufacturers covering specified time frames ranging from daily to annually. The usage reports can be specific as to inventory item, types, or prices of inventory items, dealer, manufacturer and customer as desired.

All parties in a distribution channel can use the same distribution management and inventory control system described herein. For example, manufacturers or dealers may use the same monitoring system at their facilities as do the end user customers.

Those skilled in the art will appreciate that the present invention encompasses many variations in the preferred embodiment described herein. Having thus described this embodiment, the following is claimed as new and desired to be secured by Letters Patent:

CLAIMS:

1. A distribution management and inventory tracking method for tracking usage of inventory items stored in a storage area, said method comprising:

(a) receiving, into a receiving computer, item identification data representative of an inventory item of the storage area;

(b) electronically transmitting inventory data including said item identification data from said receiving computer to a host computer; and

(c) tracking said inventory item in said host computer using said inventory data.

2. The method of claim 1, said inventory item including machine-readable, item identification indicia thereon, step (a) including the step of reading said indicia with an indicia reader coupled with said receiving computer, producing therefrom said item identification data, and providing said item identification data to said receiving computer.

3. The method of claim 2, said indicia including optically readable indicia, step (a) including the step of reading said indicia with an optical reader as said indicia reader.

4. The method of claim 3, said indicia including a bar code, step (a) including the step of reading said indicia with a bar code reader as said indicia reader.

5. The method of claim 1, step (a) further including the step of receiving user identification data into said receiving computer representative of the identification of a person entering the storage area.

6. The method of claim 5, step (b) including the step of electronically transmitting said user identification data to said host computer.

7. The method of claim 1 further including the step of repeating steps (a)-(c) for a plurality of inventory items.

8. The method of claim 1 further including the step of repeating steps (a)-(c) for a plurality of facilities of the customer.

9. The method of claim 8 further including the step of repeating steps (a)-(c) for a plurality of inventory items.

10. The method of claim 9 further including the step of, in said host computer, consolidating said item identification data for all of the inventory items from all of the facilities of a party as consolidated inventory data.

11. The method of claim 10 further including the step of providing a consolidated invoice to the party for inventory items corresponding to said consolidated inventory data.

12. The method of claim 9, there being a plurality of dealers associated with different ones of the facilities for supplying the inventory items thereto, said method further including the step, in said host computer, of sorting said inventory data by dealer to produce dealer-specific data for each dealer and providing said dealer-specific data thereto.

13. The method of claim 12 further including the step of, in said host computer, consolidating said item identification data for all of the inventory items from all of the facilities of the customer for all of the dealers as consolidated inventory data and providing a consolidated invoice to the customer for inventory items corresponding to said consolidated inventory data.

14. The method of claim 13 further including the step of the dealers replenishing inventory items in the storage areas of respective facilities in response to said dealer-specific data.

15. The method of claim 12, said item identification data being in an indicia code corresponding to respective indicia on the inventory items, the dealers having item identification data corresponding to the inventory items in respective dealer codes, said method including the step of converting said inventory data from said indicia code to item identification data in terms of said respective dealer codes for each of the dealers as part of said dealer-specific data.

16. The method of claim 15, said converting step including the step of using lookup tables corresponding respectively to the dealers for converting said item identification data.

17. The method of claim 9, the inventory items being manufactured by a plurality of manufacturers, said method including the step of extracting from said inventory data manufacturer product data representative of inventory items manufactured by each of the respective the manufacturers and providing said manufacturer product data to each of the corresponding manufacturers.

18. The method of claim 17 further including the step of at least one manufacturer producing additional inventory items in response to said manufacturer product data.

19. The method of claim 9, there being a requirement for reporting associated with the usage levels of selected ones of the inventory items, said method including the step of deriving from the inventory data the usage levels of said selected ones of the inventory items for each of the facilities and composing reports in prescribed formats corresponding thereto.

20. The method of claim 19 further including the step of producing product safety data reports as said reports.

21. The method of claim 19 further including the step of producing environmental impact reports as said reports.

22. The method of claim 1 including the step of receiving said item identification data into a personal computer as said receiving computer located at the site of the storage area.

23. The method of claim 1,

step (a) including the step of receiving said item identification data into a personal computer as said receiving computer located at the site of the storage area,

the inventory items including respective bar codes thereon, step (a) including the step of reading said bar codes with a bar code reader, producing therefrom said item identification data, and providing said item identification data to said receiving computer,

said method further including the step of repeating steps (a)-(c) for a plurality of inventory items for a plurality of storage areas,

there being a plurality of dealers associated with different ones of the storage areas for supplying the inventory items thereto, said method further including the steps of sorting said inventory data by dealer to produce dealer-specific data for each dealer and providing said dealer-specific data thereto, consolidating said item identification data for all of the inventory items from all of the storage areas for all of the dealers as consolidated inventory data and providing a consolidated invoice for inventory items corresponding to said consolidated inventory, and replenishing inventory items in the storage areas in response to said dealer-specific data.

the inventory items being manufactured by a plurality of manufacturers, said method including the step of extracting from said inventory data manufacturer product data representative of inventory items manufactured by each of the respective manufacturers and providing said manufacturer product data to each of the corresponding manufacturers.

24. The method of claim 1, step (b) including the step of transmitting said inventory data over a conventional communication medium.

25. The method of claim 24, step (b) including step of transmitting said inventory data by way of the internet.

26. A distribution management and inventory tracking apparatus for tracking usage of inventory items stored in a storage area, the inventory items having machine-readable, item identification indicia thereon, said apparatus comprising:

a receiving computer associated with the storage area,

an indicia reader coupled with said receiving computer and operable to read the indicia on inventory items in the storage area, to produce therefrom item identification data, and to provide said item identification data to said receiving computer, said receiving computer being operable to transmit electronically inventory data including said item identification data;

a host computer operable to receive said inventory data from said receiving computer and to process said inventory data in order to track said inventory items.

27. The apparatus of claim 26, said indicia including bar codes, said indicia reader including a bar code reader.

28. The apparatus of claim 26, said receiving computer including a personal computer located within the storage area.

29. The apparatus of claim 26 further including an identification card reader operable to read the identification card of a person entering the storage area, said inventory data including user identification data representative of the identification of the person entering the storage area.

30. The apparatus of claim 26, there being a plurality of storage areas and a plurality of inventory items, the host computer being operable to consolidate said item identification data for all of the inventory items from all of the storage areas as consolidated inventory data and to provide said consolidated inventory data to a party operating the storage area.

31. The apparatus of claim 30, said host computer being operable to provide a consolidated invoice for inventory items corresponding to said consolidated inventory data.

32. The apparatus of claim 26, there being a plurality of dealers associated with different ones of the facilities for supplying the inventory items thereto, said host computer being operable to sort said inventory data by dealer to produce dealer-specific data for each dealer and to provide said dealer-specific data thereto.

33. The apparatus of claim 32, said item identification data being in an indicia code corresponding to respective indicia on the inventory items, the dealers having item identification data corresponding to the inventory items in respective dealer codes, said host computer being operable to convert said inventory data from said indicia code to item identification data in terms of said respective dealer codes for each of the dealers as part of said dealer-specific data.

34. The apparatus of claim 33, said host computer being operable to use lookup tables corresponding respectively to the dealers for converting said item identification data.

35. The apparatus of claim 26, the inventory items being manufactured by a plurality of manufacturers, said host computer being operable to extract from said inventory data manufacturer product data representative of inventory items manufactured by each of the respective the manufacturers and to provide said manufacturer product data to each of the corresponding manufacturers.

36. The apparatus of claim 26, there being a requirement for reporting associated with the usage levels of selected ones of the inventory items, said host computer being operable to derive from the inventory data the usage levels of said selected ones of the inventory items for each of the facilities and composing reports in prescribed formats corresponding thereto.

37. The apparatus of claim 36, said reports including product safety data reports and environmental reports.

38. A distribution management and inventory tracking method for tracking usage of inventory items stored in a storage area, said method comprising:

(a) receiving item identification data representative of an inventory item of the storage area;

(b) transmitting inventory data including said item identification data to a host computer; and

(c) tracking said inventory item in said host computer using said inventory data.

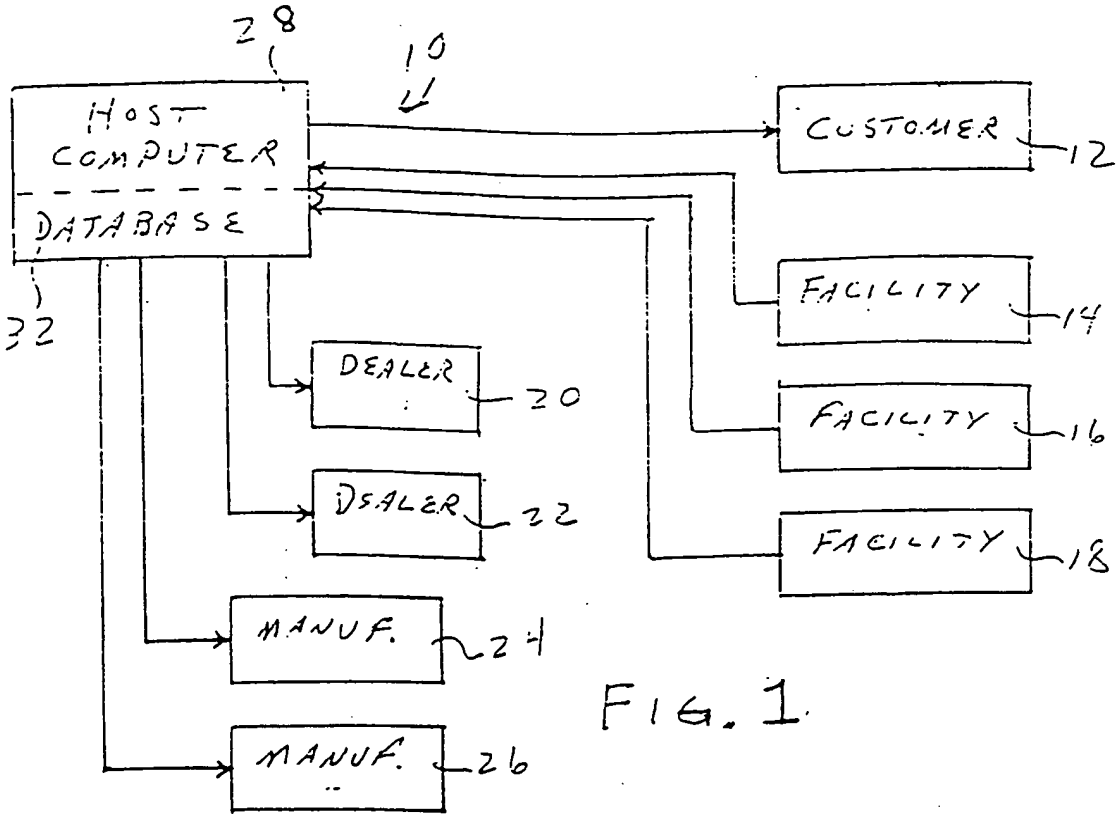

28
10
HOST COMPUTER
DATABASE
32
CUSTOMER
12
FACILITY
14
FACILITY
16
FACILITY
18
DEALER
20
DEALER
22
MANUF.
24
MANUF.
26

FIG. 1

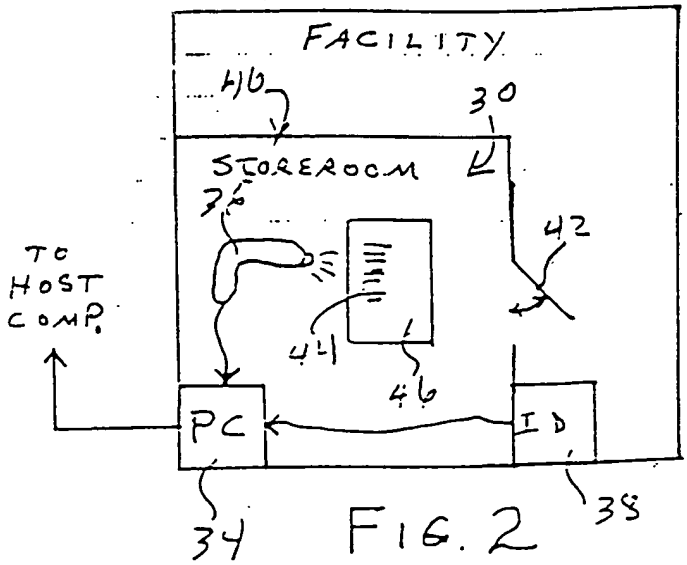

FACILITY
40
30
STOREROOM
36
42
TO HOST COMP.
44
46
PC
ID
34
38

FIG. 2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/04192

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : G06F 13/40, G06M 7/04

US CL : 705/28, 705/29, 705/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 705/28; 705/29; 705/10; 705/8; 705/9; 705/22

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EAST and DIALOG

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	us 5,765,143 A (SHELDON et al) 09 June 1998, FIG. 2, and FIG. 3.	1-38
Y	US 4,336,589 A (SMITH et al) 22 June 1982, FIG. 1, FIG. 2, and FIG. 8.	1-38
Y,P	US 6,026,378 A (ONOZAKI) 15 February 2000, FIG. 2, FIG. 13, FIG. 18, FIG. 21.	1-38

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 18 JULY 2000	Date of mailing of the international search report 02 AUG 2000
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer JAMES TRAMMELL Telephone No. (703) 305-9768

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